Reaction Times

Statistics Project

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Year 8 2012

Introductory Statement:

The problem: to be investigated is whether or not people respond more quickly to their dominant or non-dominant hand. My ***prediction/hypothesis*** is that the vast majority of Year 8s who participated in the Census@school questionnaire (Ref: www.abs.gov.au/censusatschool) react faster with their dominant hand rather than their non-dominant hand.

I decided to conduct this research on year 8 boys and girls in all states and territories across Australia and I did this by choosing a random sample size of 30 students who did the 2012 Census@School Questionnaire.

There are many disadvantages if you collect numerical data from the Census@school website. In these random samples, many errors could have been made whether intentionally or unintentionally. It is a possibility that many children don't know the difference between their dominant and non-dominant hand and this could have led to inaccurate results.

Frequently reaction times like 0.04, 1.89, 23 seconds appear on the random sample spread sheet. This could have been because the students cheated, guessed or perhaps were just being silly. It is physically impossible to get a reaction time less than 0.1 seconds and times above 1 second are relatively slow. For example, in 100 metre racing, a reaction time less than 0.1 seconds is considered to be false start. (Ref: http://en.wikipedia.org/wiki/100_metres)

Outlying data like this skews up your results so therefore I have decided not to include the outliers who are more than 0.6 seconds or less than 0.2 seconds.

Data Collection

I have sorted the data with the dominant hand in ascending order, as shown in the following table:

In this investigation, Dominant hand is always shown in blue and Non-dominant hand is always shown in red.

Dominant hand	Non dominant hand
0.26	0.26
0.28	0.32
0.29	0.4
0.3	0.35
0.3	0.43
0.32	0.37
0.33	0.34
0.33	0.41
0.34	0.34
0.34	0.39
0.34	0.48
0.35	0.32
0.35	0.38
0.35	0.51
0.37	0.41
0.37	0.42
0.37	0.43
0.37	0.51
0.39	0.4
0.39	0.48
0.41	0.44
0.42	0.32
0.42	0.39
0.42	0.53
0.43	0.4
0.43	0.42
0.45	0.45
0.46	0.54
0.53	0.5
0.75	0.54

Data Analysis

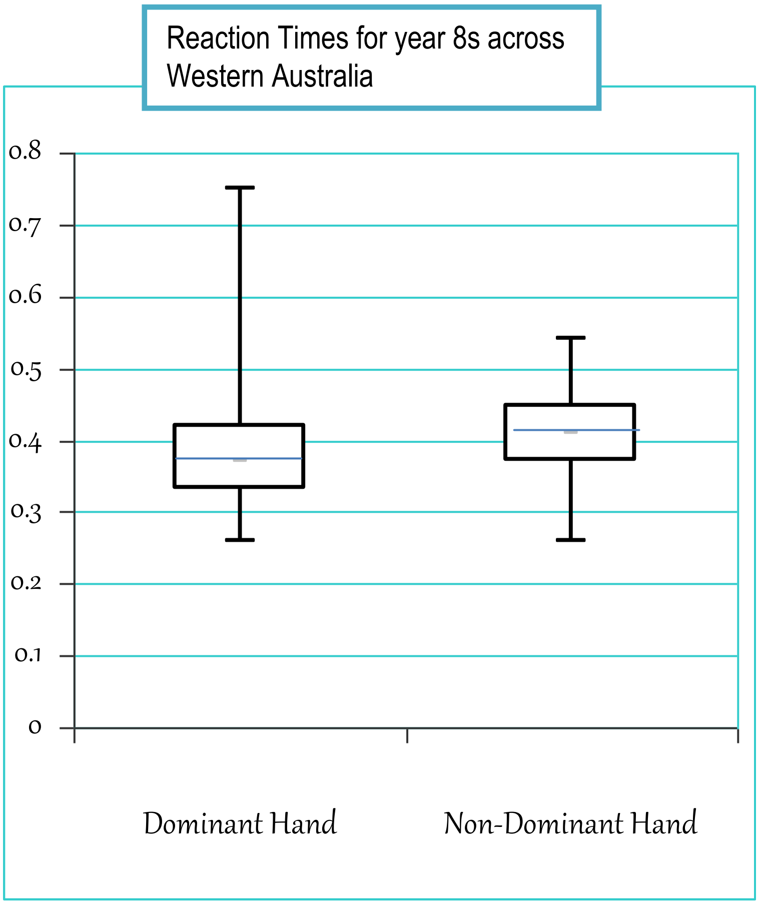
I have shown the different statistical measures as per the table below, this has been calculated by the Microsoft Excel functions.

I evaluated the data for possible outliers and came to the conclusion that all of the reaction times data; both non-dominant and dominant hand should be between 0.1 and 0.8 seconds. I chose these times because the human brain cannot hear and process the information from the start sound or signal in under 0.1 second and any times above 0.8 seconds are relatively slow. I had decided to consider as outliers any times that did not fall between the 0.1 – 0.8 seconds. Based on this criterion, there were no outliers.

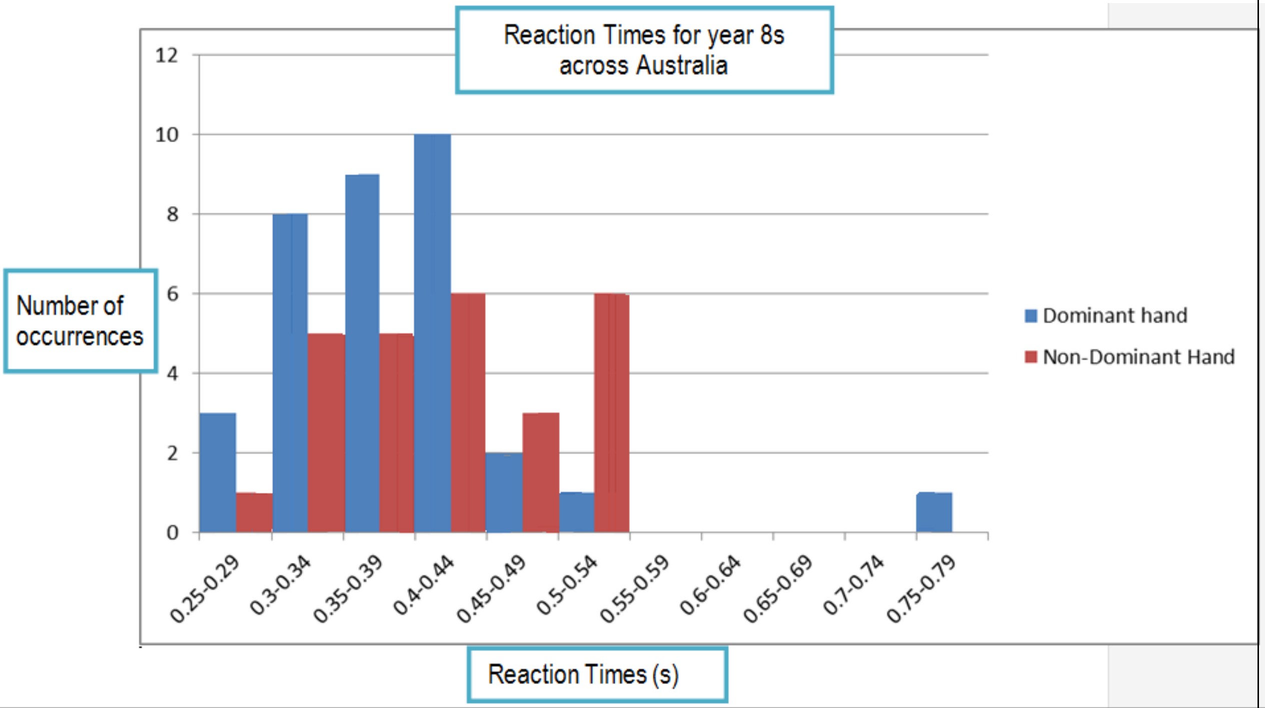
Outliers often significantly affect the average of the data because the numerical magnitude of the outlier is included in the total which is used to calculate the average, these extreme values skew up and distort your average. Outliers have relatively minor affect on the median because a single outlying value will just move the median by one position.

Method	***Dominant Hand***	***Non-Dominant Hand***
Mean	0.38	0.42
Mode	0.37	0.32, 0.4
Range	0.49	0.28
Min	0.26	0.26
Quartile 1	0.33	0.37
Median	0.37	0.41
Quartile 3	0.42	0.45
Max	0.75	0.54

Represent the data



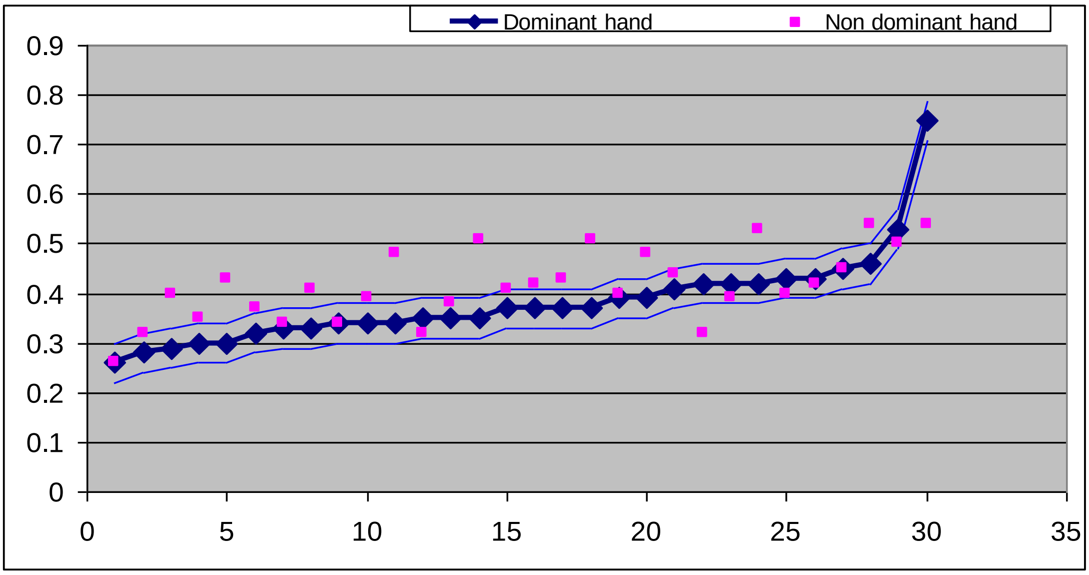
As seen from the above graph, for most of the data, the inter-quartile range (25 percentile – 75 percentile) of the dominant hand has the faster reaction time. Even though the dominant hand shows a greater variation (bigger spread of scores) than the non – dominant hand, this was due to a single outlier. The interquartile ranges are similar but both the fastest and slowest reaction times were from the dominant hand.



This graph represents the number of people having reaction times, for their dominant and non-dominant hand in specific time intervals. A can be seen from this graph; more people have faster reaction times for their dominant hand.

Conclusion

Reaction Times for year 8s
across Western Australia



Each value on the x-axis represents a person for whom the dominant and non-dominant reaction times are shown in blue and pink points. A band of +/- 0.04 seconds is plotted on either side of the dominant reaction times. This can be considered as the normal spread in reaction times and that is why I am ignoring this variation.

Based on the above scatter graph the observations can be made:

- 43% times, the non- dominant hand reaction time is roughly the same as the dominant hand reaction time for that person.
- 50% of the time, the non – dominant hand reaction time is slower than the dominant hand reaction time for that person.
- 7% of the time, the non-dominant hand reaction time is faster than the dominant hand reaction time for that person.

Another way of represent the data is to plot the non-dominant reaction times on the y-axis versus the dominant hand reaction times on the x-axis as shown below. If the times for a person were the same, the point would fall on the 45 degree line shown below.

As clearly seen, the majority of the points fall above the line which shows that the dominant hand is usually faster than the non-dominant hand.

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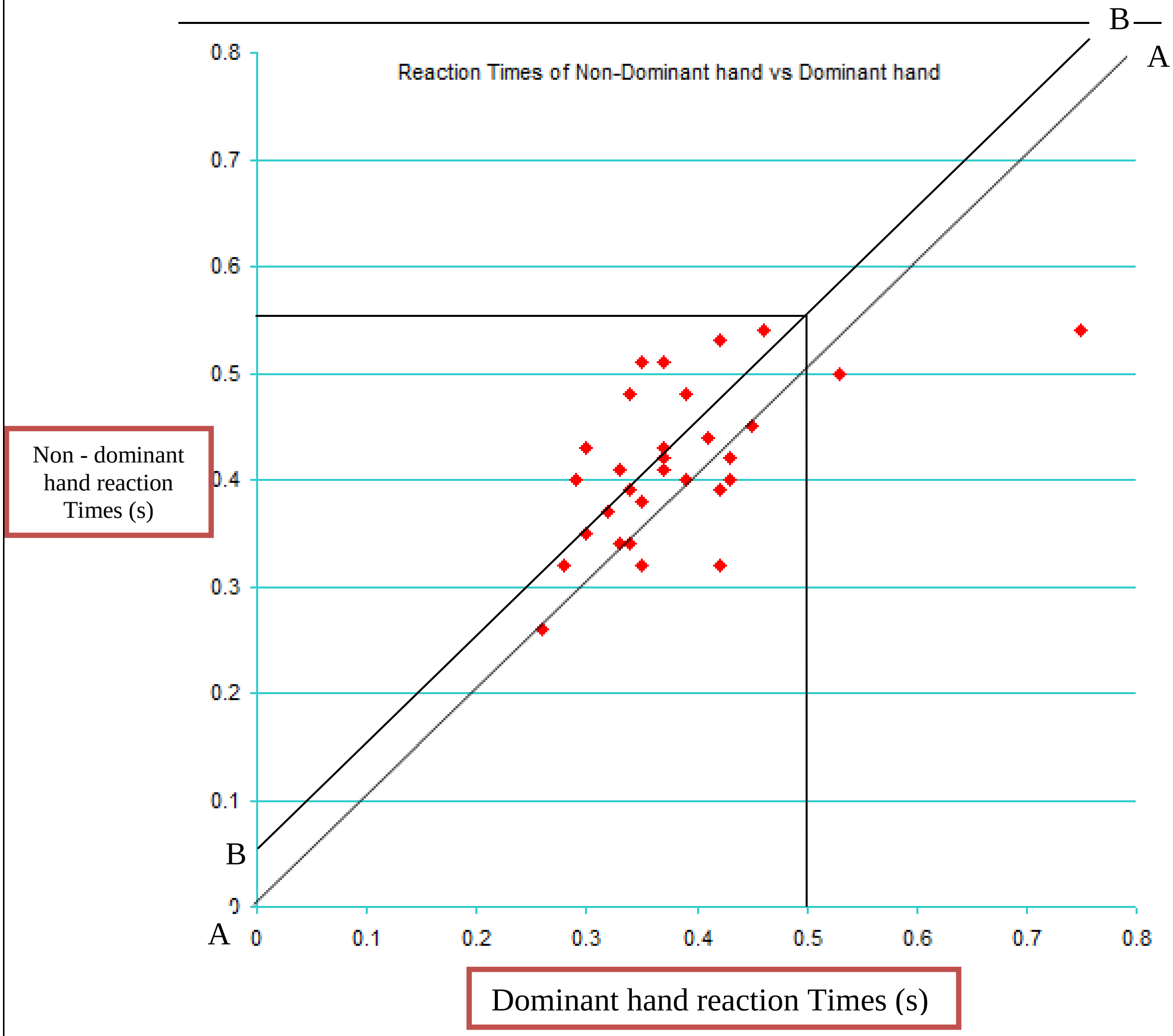
Please Turn Over



Based on all of my previous analysis, the first two charts show that as a group, the dominant hand reaction times are faster and the last two charts represent that individually also, the dominant hand reaction times are faster.

If all points lie on or around line A-A, then the reaction times for non – dominant hand and dominant hand are roughly the same. However, the points actually lie around the line B-B which means that the dominant hand reaction times are approximately 0.05 of a second faster than the non-dominant hand reaction times.

Therefore, on an average, the dominant hand reacts around 0.05 of a second faster than the non – dominant hand.

References

- http://www.abs.gov.au/censusatschool - for the data
- Haese and Harris Year 8 textbook
- http://en.wikipedia.org/wiki/100_metres

- http://www.chandoo.org